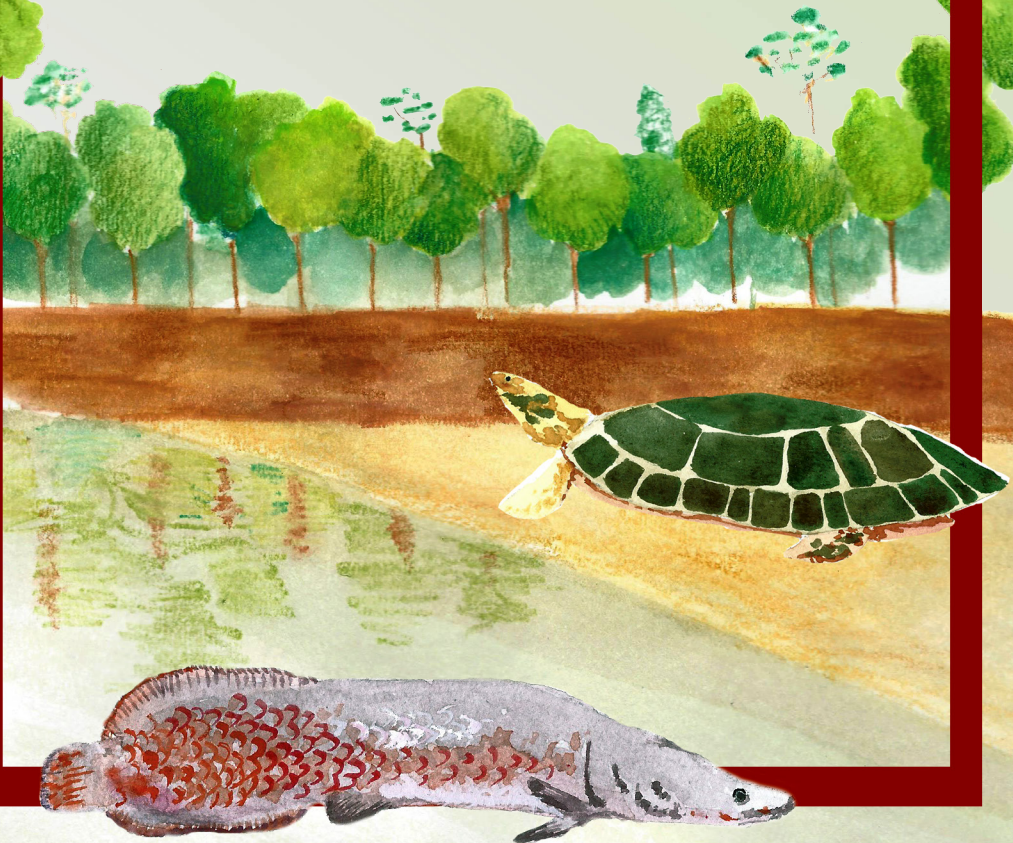


# **Community management and conservation of pirarucu lakes and turtle nesting beaches:**

**An integrated conservation and sustainable development  
tool for Amazonian várzea forests and communities**



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## Foreword:

Pirarucu management is one of the best examples of sustainable development in the Amazon. From the environmental point of view, management protects not only natural pirarucu populations. By eliminating predatory fishing, other fish species are also conserved. From the economic point of view, management increases the income of fishermen, with the decrease of middlemen operation. In addition, the increase in income benefits from the valuation of fish leather and the direct sale for school lunches or specific markets in fairs in the municipalities of the interior or in Manaus. From the social point of view, management strengthens communities and residents' of conservation units organizations. This contributes to the empowerment and the advocacy of marginalized populations.

This booklet developed by the team lead by Prof. Carlos Peres incorporates results from his researcher's group as well as practical experiences and researches from several institutions. Initially developed by the Mamirauá Institute team, pirarucu management has gained strong support with investments made by FAS over the last 10 years: over R\$3.4 million were invested. These investments have complemented government operations developed since 2003 in Amazonas. Additionally, it's worth noting the efforts of several residents' organizations such as Associação dos Moradores e Usuários da Reserva Mamirauá

- Antônio Martins (AMURMAM), Associação dos Produtores Rurais de Carauari (ASPROC), Associação dos Moradores da RDS Uacari (AMARU), Central de Usuários e Moradores da Reserva Amanã (CAMURA) and Associação de Moradores e Entorno da RDS Piagaçu-Purus (AMEPP).

There are still great challenges for the pirarucu management. From the biological standpoint, there are themes related to the fluctuation of populations, genetic variations and interaction with other species. From the economic standpoint, the main challenge is to reduce logistics costs and raise market value for the skin, meat and other pirarucu products. From a social standpoint, the challenge is to strengthen business management and to ensure greater equity in the distribution of benefits. From a general standpoint, we have the need to broaden the number of managed lakes. In this sense this booklet has an extremely important role.

*Prof. Virgilio Viana*  
FAS CEO

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<sup>1</sup>Between 2010 and 2015, almost R\$2.5 million were invested on the chain and, on the second Amazon Fund project, over R\$950 thousand have been invested between 06/01/2016 and 05/31/2018. Investments made include support to infrastructure (fishery development units, loating houses), logistics (boats and motors for production runoff) and marketing (pirarucu fairs, business roundtables).



# **Community management and conservation of pirarucu lakes and turtle nesting beaches:**

**an integrated conservation and sustainable development tool for Amazonian várzea forests and communities**

## **1. Introduction**

The rivers of the Amazon are classified into three categories, according to the colour of their water - white, black or clear. In addition to the different chemical characteristics of the waters that influence their colour, these rivers are also quite different in relation to productivity, with white water being the most productive.

White water rivers are born in the Andes mountains and carry a great load of sediment and nutrients that originate from the rocks rich in phosphate, a fundamental nutrient for all living beings. The effect of the rains causes the volume of water in the rivers to increase enough during some months of the year, to flood wide areas, including the forests that border the rivers. When these forests are flooded, the nutrients present in the river waters spread throughout the flooded area, contributing to the very high productivity of the system as a whole.

The extensive area flooded annually by white water rivers is called várzea, and supports a system rich in biodiversity, in which human populations live in a close relationship with nature, especially fish. Thousands of species of mammals, birds, reptiles, amphibians and plants coexist in this environment, both in the wet and dry seasons. And human communities have developed their economic activities accordingly in order to use these resources for their subsistence and income generation.





The Amazonian floodplains generate food for many families and are responsible for maintaining a large part of fishing economy of the countries within their borders. Therefore, to speak of the conservation of the floodplains is to speak of the food and social security of millions of people who depend heavily on the natural resources present within this important ecosystem. However, threats to floodplains continue to grow - over-exploitation of fisheries, deforestation, mining, hydroelectric construction and pollution are just some of the human activities that are destroying the floodplains and their resources.

Basically, there are currently no specific tools to protect these environments and the Brazilian government is unable to manage and direct the use of natural resources in a satisfactory way, since there are insufficient human

and financial resources to guarantee the conservation of the ecosystem and the well-being of the human populations that resides within it. Therefore, the involvement of riverine communities in this process is fundamental. If rural populations living on the floodplain are not included in conservation proposals, the complete degradation of this important environment is likely to be only a matter of time.

With this in mind, this handbook highlights two community initiatives that are succeeding in bringing a series of ecological and economic benefits, and that can be used in an integrated way as a floodplain conservation tool, with associated improvements to the quality of life for riverside people. These initiatives are the management of pirarucu and the protection of freshwater turtle nesting beaches.





## **Community management: what is it and what is it for?**

The livelihoods of riverine communities are supported to a large degree by the rivers, floodplains and forests, so it is their right to participate in the decision-making that will directly influence the use of natural resources within the region in question. In addition, the government, even working hand-in-hand with NGOs and universities, does not have sufficient resources to manage the use of natural resources in a satisfactory manner. Therefore, the decentralization of decision-making through the inclusion of local people becomes a great tool to increase the number of people actively involved in conservation.

Community management is increasingly promoted as a possibility to establish a sustainable relationship with natural resources, in which decision-making and regulation are evaluated in an inclusive manner by all the people and institutions involved. This strategy has been used positively in many places around the world, such as in the management of coral reef fisheries in Oceania, the exploitation of forests in India, and the conservation of biodiversity in African savannas. In addition to increasing the number of people caring for the environment, community-based management contributes towards improving the quality of life for local populations, since it allows the maintenance of important cultural activities and also generates income, contributing to the reduction of poverty, especially in tropical countries that continue to strive for economic development.

## 2. Community management of pirarucu

### Pirarucu

Pirarucu (*Arapaima* spp.) is one of the largest freshwater fish in the world and is of great importance in the Amazonian context, with a high ecological, economic and cultural value. In the past, adult individuals reached up to 3 m in length and weighed more than 240 kg, but nowadays rarely exceed 1.5 m and 90 kg due to heavy exploitation. Pirarucu was the first fish species to show signs of population decline in the Brazilian Amazon, which resulted in a ban on its fishing in the early 2000s. However, illegal pirarucu fishing is still widespread and occurs on a large scale. This situation is exacerbated by the fish's economic and cultural value combined with inefficient surveillance, which is hampered by the enormous geographical areas of the Amazon and the decentralised nature of fish landings and trade.



## Harvesting to conserve

In the face of the threat posed by pirarucu populations, community management emerged as an alternative to guarantee the sustainable use and conservation of this fish in the floodplain areas of the Amazon. Pirarucu management is performed in a collaborative way and involves diverse segments of society, including rural communities, government, associations, NGOs, and universities. The fishery is based on a quota system, calculated according to the number of individuals (adults and juveniles) present in each site to be fished. The number of individuals is determined from a counting method inspired by the local knowledge of fishermen and tested by scientific methods. The maximum catch permitted by the Brazilian Institute for the Environment and Renewable Natural Resources (Instituto Brasileiro do Meio Ambiente e dos Recursos Naturais Renováveis, IBAMA) is 30% of the total adult individuals counted in each location.



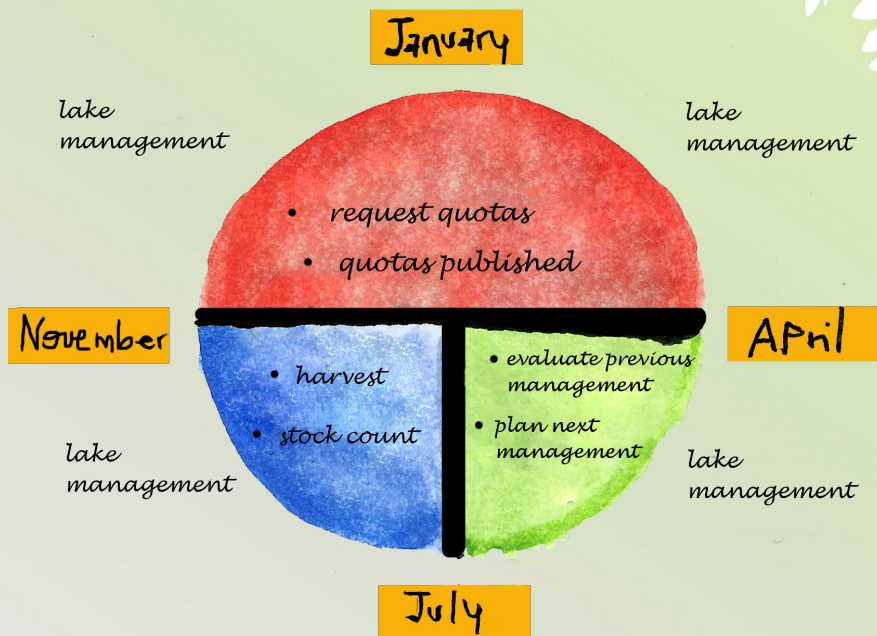
## **Brief history**

The first pirarucu management scheme was conducted in the Mamirauá Sustainable Development Reserve (RDS Mamirauá, mid-Solimões, Amazonas) in the early 2000s, proposed and tested by researchers and technicians of the Mamirauá Institute for Sustainable Development. The results were very positive, and pirarucu management began to proliferate across the Amazon. Today it occurs in about 14 municipalities within the state of Amazonas, encompassing about 300 communities and more than 3000 fishermen, and has begun spreading to other states within the Amazon region.

## **How the management works**

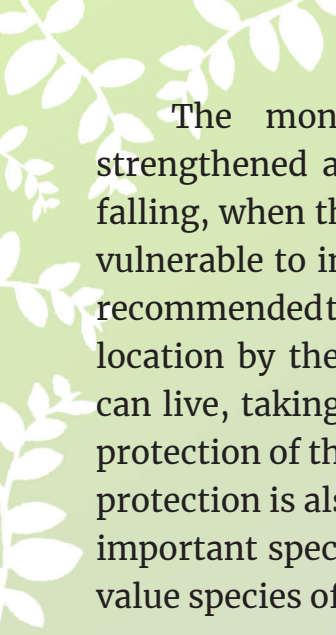
The management of pirarucu occurs in stages distributed throughout the year. Harvest quotas are requested at the beginning of the year, according to the previous year's count. Around July-August, the pirarucu are counted in the lakes, which will inform the harvest quotas for the following year. This is followed by the harvest, which should be completed by November, before the pirarucu's reproductive period. Finally, there is the assessment of the management and submission of the report to IBAMA. In parallel with these activities, lake guarding takes place throughout the whole year.





## Lake guarding

Lake protection or guarding, is one of the most important aspects of pirarucu management because without protection, there would be fewer pirarucu in the lakes selected for management, which reduces the number of individuals available for harvest. In the wet season, when lakes become connected to each other, pirarucu tend to leave the lakes and enter the floodplain forests where they spend the entire flood season. As the water levels fall, the pirarucu return to the lakes, where they will feed and reproduce.



The monitoring of protected lakes should be strengthened at those times when the water is rising or falling, when the lakes have many entrances and are more vulnerable to invasion by illegal fishermen. It is therefore recommended that the community build a house in a strategic location by the lake, where guards from the local village can live, taking turns for a few days to ensure permanent protection of the area. It is also worth mentioning that lake protection is also fundamental for the populations of other important species, like freshwater turtles and other high-value species of fish, such as tambaqui and pirapitinga.

## **Implementing the harvest**

Community members interested in developing pirarucu management must submit a management plan, linked to an association or institution responsible for acting as an intermediary between local communities and IBAMA. The management plan should include three years of pirarucu counts in the area to be managed, diagnoses of the communities involved, mapping of lakes (with strictly-protected areas and areas of subsistence and commercial use), and other relevant information. If the community is located outside a protected area, it should be part of a fisheries agreement, as detailed later.

## Counting pirarucu

Counts should be performed once a year in the dry season. During this period the lakes are partially disconnected from the river and pirarucu tend to concentrate in them, which facilitates the counting of individuals. Counters must be fishermen experienced in pirarucu fishing, who have already undergone a training process and are able to follow the standards required by IBAMA. For counting, the counters are distributed along the lake, so that each has a good view of the entire surface of the lake to the area of the next counter. Counters record the number of adult and juvenile pirarucu more than 1 m in length (locally known as “bodecos”) that surface to breathe inside their sampling area within a 20-minute interval. All fishermen must conduct the counting simultaneously. If the number of counters is not sufficient to cover the entire area of the lake, new counts must be made in the remaining areas until the entire lake has been sampled. At the end, the number of adults and juveniles counted in the lakes are recorded. This information is then sent to IBAMA to request the fishing quota for the following year.



## Requesting quotas

Quota requests should be made at the beginning of the year, usually before April. This request covers the count data from all lakes included in the management plan. The community may suggest a quota according to aspects related to the infrastructure and fish marketing agreements, always respecting the maximum limit of 30% of the total adult count. The quota request must be submitted to IBAMA, who evaluate the application and authorise the harvest or not, depending on the submitted documentation, the count data and the social organisation of the communities involved.



## **Fishing pirarucu**

Fishing must be carried out within the period allowed by IBAMA for each region. Fishermen must respect the minimum catch size, established by law, which currently corresponds to 1.55 metres. Sex, weight, length and reproductive status are recorded from all the individuals captured. This information must be recorded in a table to be sent to IBAMA with the fishing report. Fish need to be marked with numbered tags that identify the origin of each fish. The commercialisation and transportation of managed fish must comply with IBAMA's control through a 'Fish Traffic and Marketing Guide'.

## **Evaluating the harvest and reporting to IBAMA**

Every year, the institution responsible for the management, together with IBAMA, must send to this body the annual management report and quota requests for the following year. The report should include information on both the harvest and sale processes. Management reports are an important source of information on the development of management at each site, contributing to the monitoring and evaluation of management units.

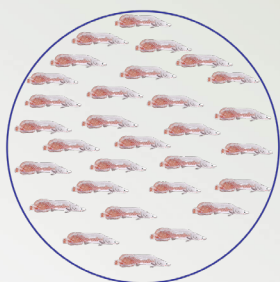
## Benefits of the harvest

Studies have pointed to the success of the pirarucu collaborative management in several places in the Amazon. In the RDS Mamirauá, for example, after eight years of management the adult pirarucu population grew 24 folds. At the same time, the number of pirarucu in adjacent areas where management was not occurring remained stable at low densities, reinforcing the conclusion that management was the driving force responsible for the large increase in pirarucu populations.

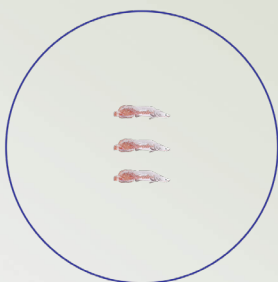
In the Juruá region, protected lakes managed by local people currently have an average of 305 adult pirarucu individuals compared to an average of just nine in unprotected lakes, with pirarucu density 131 times higher in protected than in non-protected lakes. In this region, after ten years of management, the pirarucu population has grown 213% in protected lakes, while in unprotected lakes it has declined or remained stable, with very few individuals.

In the lower Purus region, pirarucu management has promoted a mean increase in pirarucu population density of up to 77% per year. In this region, all areas where there was no collaborative pirarucu management have recorded very low abundances (0 to 0.02 individuals/ha), while in the managed areas abundance was much higher (0.18 to 0.32 individuals/ha) after the first years of management.

Management has also brought economic benefits to rural families in the Amazon. In the Juruá region it was recently estimated that protected lakes produced an average of R\$35,000 from the sustainable harvest of pirarucu, respecting IBAMA's quota system. This aspect of management is highly relevant if we consider the few financial opportunities that these families generally have access to. Community members have been very satisfied with the local recovery of pirarucu stocks, which is associated not only with economic advantages, but also with the cultural importance that pirarucu has in the region. The high economic and cultural value of the pirarucu serves as a great stimulus for further community engagement in this form of management, which has direct consequences for the ecological success of the system, generating a cycle of positive feedback.



**Protected lakes**



**Subsistence lakes**



**Unprotected lakes**

## **Pirarucu: an umbrella species**

Besides the recovery of pirarucu stocks, it has been noticed that management also favours other aquatic organisms, which benefit from the lake protection. Several studies have found that freshwater turtles benefit from this protection, showing much higher abundance in protected lakes. The same happens with alligators, which represent a possible management opportunity in the future. Other fish species of high economic value also have elevated abundance in protected lakes, particularly in the case of tambaqui.





## **Who can implement?**

At present, the pirarucu management is only allowed inside conservation units designated for extractive or sustainable use, or in areas where there is a Fisheries Agreement published in the Official Union Gazette (‘Diário Oficial da União’) based on the regulations described in the ‘Instrução Normativa IBAMA nº 29, of December 31, 2002’.

## **Implementation outside protected areas**

For the development of pirarucu management outside protected areas, an officially approved Fishing Agreement must be in place. Fisheries Agreements are rules created by rural communities, professional fishermen and other bodies involved in fishing, to organize and control fishing activities in a given region. The agreements are built in a participatory manner and are subsequently formally recognized by the government, serving as an asset management tool. Fisheries Agreements can be complex because they involve people with different objectives but they are the most democratic way of organizing access to fish, ensuring the well-being of all involved and the sustainability of the fishery.

## How to make a fishing agreement?

When a community or some other group intends to propose a Fisheries Agreement, it should be clear that this proposal needs to involve all those involved in fishing in the region. To that end, meetings should be held to explain the reasons for establishing a Fisheries Agreement. It is also necessary to involve the institutions present in the region, such as the local government, the city council, state environmental departments, NGOs, etc.

It is always good to have someone experienced in this type of activity, who knows the laws and has conducted such meetings previously. It is recommended that the fishermen syndicate ('colônia de pescadores') assist in the conduct of the process, since they are usually already used to holding meetings with fishermen and have a good understanding of the local context for lakes in the region. During discussions at meetings the lakes need to be classified into different categories and mapped in a participative way or with the aid of a GPS. The categories of lakes commonly used in a Fisheries Agreement are:

*Strictly Protected Lakes:* This category is intended to ensure the reproduction of various species of fish, so fishing is forbidden and the lake is permanently protected.

*Sustainable Harvest Lakes:* These lakes are also protected, but management of some species is allowed once a year. It is in these lakes that pirarucu are managed.

*Subsistence Fishing Lakes:* Fishing is only permitted for subsistence; commercial fishing is prohibited.

*Commercial Fishing Lakes:* Fishing is permitted, for either subsistence or commercial purposes.

In addition to categorising the lakes, the rules governing the use of resources should also be laid down i.e. the rules to be respected by fishermen in the Fisheries Agreement region. Such rules may include, for example, species that cannot be caught in a certain area, periods in which fishing cannot be carried out, limitations on some types of fishing gear, prohibition of some types of vessels, and limitations on the amount of fishermen per vessel, among others.

After the classification and mapping of lakes, and the establishment of rules, the proposed Fishing Agreement must be sent to the responsible institution. The proposal must contain the minutes of the meetings with attendance lists and photos, in addition to the established rules and a map with all mapped lakes. In the State of Amazonas, the institution responsible for the agreement is the State Secretariat for the Environment (Secretaria Estadual do Meio Ambiente, SEMA). Upon receipt of the documentation, the responsible body schedules a public hearing to formalise the agreement in the presence of all those involved. Once concluded, the agreement will be published in the *Diário Oficial da União*. After publication, the agreement should be respected as a law.

## **Why is it important to think of pirarucu management outside protected areas?**

In general, unprotected areas tend to experience much greater pressure than protected areas, and currently only a small proportion of Amazonian floodplains are within Conservation Units. Therefore, actions that ensure the conservation of natural resources outside protected areas are extremely important for the maintenance of Amazonian biodiversity and people's livelihoods in rural areas. In addition, communities outside protected areas have often been marginalised by public policies and income-generating projects, and so pirarucu management would provide an important alternative for such communities. Another relevant aspect is that the greater the scarcity of fish outside protected areas, the greater the pressure and conflicts within protected areas. Therefore, pirarucu management appears to be a great opportunity to protect fisheries outside conservation units, to promote the protection of Amazonian aquatic biodiversity and to avoid future conflicts.

## **Difficulties and challenges**

Despite the benefits related to pirarucu management, there are also several difficulties that threaten the scheme's economic sustainability. First, there is a clear problem with the production process. As all managed pirarucu are harvested during the same period of the year, this tends to



lead to a saturation of the market in the region. As a result, many have difficulty finding a buyer for their product, especially for a fair price. In addition, the large supply of illegal pirarucu often competes unfairly with managed pirarucu, causing buyers to offer a much lower price than appropriate for a sustainable harvested one.

Another important point is that communities do not generally have access to the initial capital necessary for establishing a management scheme, and so are dependent upon external investments. Essential start-up costs mainly include the purchase of fishing equipment suitable for pirarucu fishing and the construction of a fish treatment site. There are also expenses related to the transport of fish to the city each year, which includes the purchase of fuel and ice, in addition to payment of freight rates or boat rental in cases where the community does not have their own boat. Finally, there are costs related to government health and safety requirements. Rural communities are far from having sufficient financial conditions to be able to meet the standards necessary to enter the market. These requirements have frequently acted as a strong barrier to the development of pirarucu management.

### 3. Protection of turtle nesting beaches

#### Turtles

Brazil is one of the countries with the highest number of species of freshwater turtles, with 17 species (15 aquatic and two terrestrial) found in the Amazon alone. In the floodplains, three of them are of fundamental importance for conservation, since they are much consumed by the rural population: the giant South American turtle (tartaruga, *Podocnemis expansa*), the yellow-spotted Amazon river turtle (tracajá, *P. unifilis*) and the six-tubercled river turtle (iaçá, *P. sextuberculata*).



#### Turtle exploitation

Everywhere where they occur in the world, turtles have been of great importance for human consumption. The giant South American turtle or tartaruga, along with other species such as the tracajá and the iaçá, represent a group with very high cultural value for the rural population, since their meat and eggs are considered an incomparable delicacy. These

turtle species have been exploited since pre-Columbian times, providing a very important source of protein for indigenous and more recent settler societies. In addition to food, turtle eggs were widely exploited for making butter and for public lighting; it is estimated that millions of eggs were used annually for public illumination of Amazonian cities in the past. In the city of Tefé alone, about 48 million eggs were used per year for this purpose. Faced with this drastic pressure, Amazonian turtle populations declined and disappeared from many Amazonian rivers.

## **Brief history**

During times of drought, when rivers reach the minimum water levels, turtles emerge to lay their eggs on the exposed sandy beaches. Each nesting beach, called a “tabuleiro”, receives dozens, hundreds or even thousands of turtles annually, where they build their nests under the sand. With the objective of reversing the population decline, socially organised communities started a process of protecting nesting beaches, to ensure the safety of adult females and their eggs. This initiative has since spread to more than 100 locations and today is the largest conservation tool for turtles in the Amazon.

In many places, the protection of the nesting beaches began even in the days of the rubber barons, who protected beaches to guard the resources for their own exploitation. Nowadays, beach guards, or monitors as they are called,

spend about five months of the year in a wooden house across the beach, watching over it and preventing anyone trying to collect eggs or females. It is hard work, and often dangerous because the turtle has a very high value in the illegal trade. Beach guarding can be done on a voluntary or paid basis, with payment either in the form of a fixed monthly salary or, more commonly, a basic food hamper received monthly for the period they are protecting the beach. Whether the monitor receives payment or not depends on many factors and requires discussion with the community and the local government or other responsible institutions.





## **How does turtle conservation work?**

### **Beach protection**

The main task of those involved in this activity is the protection of the beaches against those who seek to benefit from the sale or consumption of the turtles and their eggs. Therefore, at the time of nesting and the emergence of hatchlings, the beaches are monitored 24 hours a day, seven days a week, because with even the slightest negligence the nests are raided or the turtles are caught in nets in front of the beaches.

### **Monitoring turtle populations**

In addition to beach protection, the guards perform the important work of monitoring the turtles' reproductive success. To do this, they count the number of nests on the beach and mark each place with a wooden stake, the day after each nest is laid. On each stake the monitor must note which turtle species nested there and the date. It is also recommended to measure the female's tracks, so that her size can be estimated.

After the emergence of the hatchlings, the monitors estimate the date that the eggs will hatch, based on previous ecological knowledge. When that day arrives, they return and dig a little to check if hatching has already occurred. If so, they count and record the number of eggs and live hatchlings. If not, the nest is reburied and the monitor returns again the following day. If there is evidence of nest predation, the monitor should note the type of predator,

identified by tracks or other signs. Finally, the monitor must record the fate of the hatchlings, which may have gone directly to the river or been placed in nearby lakes by the monitor himself to boost their chances of survival.

For the establishment of new protected nesting beaches, it is recommended to contact research groups that support the establishment of protected beaches, and are already experienced in this activity. There are many procedures involved in this activity, and so it is worthwhile contacting groups that already have previous experience, in order to increase the success rate of new initiatives.



## **Beach protection in the Médio Juruá**

In the Juruá region, the protection of nesting beaches occurs in an organised form, with 14 protected beaches, located within two Conservation Units: the Médio Juruá Extractive Reserve (RESEX Médio Juruá) and the Uacari Sustainable Development Reserve (RDS Uacari). This community work has shown very positive results, promoting a recovery of turtle populations in the region. In about 30 years of protection, approximately 2.5 million hatchlings have been released in the wild. According to experienced fishermen, the abundance of Giant south America turtle has increased considerably and this species can already be sighted again in many places where it had practically disappeared.

## **Benefits of protected beaches**

The effect of this community-based conservation programme is so strong that only an average of 2.1% of tartaruga nests located on protected beaches are raided, while that rate is 98% on unprotected beaches. It is worth mentioning that this finding is the result of a study carried out within the two Médio Juruá reserves, which indicates that, even within protected areas, community initiatives are fundamental and can be a powerful tool to ensure the long-term future of these highly valued and threatened turtle species.

## **Turtles: an umbrella species**

In addition to turtles, many other species also benefit from beach protection. Birds (such as terns, skimmers and nightjars), catfish (such as surubim, pirarara and caparari), iguanas, caiman and even crickets and beetles are examples of species that benefit from protection. These beaches are important places for reproduction and/or feeding of these species, which can all be found in much larger numbers on protected beaches than on non-protected beaches.



## **Who can implement?**

All rural communities interested in protecting a beach can implement this activity, either inside or outside protected areas. Some beaches are more likely to become nesting sites, but as long as the slope is not too steep, most beaches can be successfully adopted by tartaruga, tracajás, and iça, if there is effective protection.

## **How to implement?**

For implementation it is recommended that contact be established with the local government environment department, or with state and federal agencies, such as the Secretariat for the Environment for the state of Amazonas (Secretaria Estadual do Meio Ambiente, SDS/CEUC) and the Chico Mendes Institute for Biodiversity Conservation (Instituto Chico Mendes de Conservação da Biodiversidade, ICMBio). It is also important that communities hold meetings clarifying the goals of beach protection for other communities and fishermen who use these beaches, seeking to avoid future conflicts.



## Difficulties and challenges

The main difficulty for beach protection currently is the lack of financial support, both for the implementation and for the financial reward of monitors, who spend a good part of the year protecting turtles and their nesting habitat. The main benefit of beach protection is the recovery of turtle populations and the maintenance of the dietary and cultural habits of rural communities. However, this is hard work, because monitors have to give up other activities in order to fully dedicate themselves to beach protection, and often even risk their lives in the face of the threats they receive from those who wish to catch turtles and sell them illegally. Therefore, nothing would seem fairer than a suitable financial reward for their work. Considering the limited financial resources currently available for conservation in Brazil, it could be important to develop legal mechanisms for the commercial exploitation of turtles, which would allow a form of income generation for those involved in community management, as is the case with pirarucu. In this way, beach protection could be sustained without relying on external financial resources.

#### 4. Final considerations

Combining the lake protection system from the pirarucu management programme with the beach protection from nesting turtle programme appears to represent a great opportunity to conserve important aquatic resources of the Amazonian floodplains, since together they guarantee the reproduction and growth of species very important for the wider ecosystem and for maintaining the livelihoods of local populations.

Despite the clear benefits of the two initiatives, there are still challenges ahead. In the case of pirarucu management, it will be necessary to expand and create a new market to allow fish export to other states. At the same time, it is necessary to obtain finances and subsidies that allow community management to comply with all the norms required by Brazilian legislation. In the case of beach protection of turtle nesting sites, an interesting alternative would be the creation of an income generation mechanism so that beach monitors are encouraged to continue their protection work, guaranteeing the continuation of this important initiative. Although there are research groups investing time and money in developing mechanisms to reward these monitors for their work, there are still no legal mechanisms for the commercial exploitation of turtles, which may hamper the sustainability of the initiative in the long term.

## Partner Institutes

Associação de Desenvolvimento Sustentável da Agricultura Familiar da Região do Baixo Juruá do Lago Serrado – ARBLS

Associação dos Produtores Rurais de Carauari – ASPROC

Associação dos Moradores Agroextrativistas da Reserva de Desenvolvimento Sustentável Uacari de Carauari – AMARU

Colônia de Pescadores Z25 de Carauari – COLPESCA

Departamento de Mudanças Climáticas e Gestão de Unidades de Conservação – DEMUC/SEMA

Instituto Chico Mendes de Conservação da Biodiversidade - ICMBio

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Projeto Pé-de-Pincha

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## For further information

[www.projetomediojuruu.org](http://www.projetomediojuruu.org)

[www.pedepincha.com.br](http://www.pedepincha.com.br)

[www.fas-amazonas.org](http://www.fas-amazonas.org)

